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AID Report P-63-79

6 June 1963

SOVIET LITERATURE ON PROTECTIVE
STRUCTURES AND COMPONENTS

Review of Literature

AID Work Assignment No. 13
(Report No. 8 in this series)

Aerospace Information Division
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AID Report P-63 79 6 June 1963

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FOREWORD

This is the eighth in a report series reviewing Soviet literature on ground support equipment. It is based on materials available in the collections of the Library of Congress and on materials received by the Aerospace Information Division prior to 29 March 1963. The broad areas of interest covered by AID Work Assignment No. 13 are as follows:

I. Operational Employment and Philosophy
II. Missile Data
III. Facilities
IV. Transport
V. Launch Site
VI. Ground Support Equipment
VII. Natural Environmental Conditions
VIII. Personnel
IX. Research and Development Facilities
X. Packaging, Preservations, and Storage

The present (eighth) report deals with the following topics:

IV. Transport
V. Launch Site
E6 Accessories-- Gantries
VII. Natural Environmental Conditions
X. Packaging, Preservation, and Storage
A2 Containers

A list of the references cited accompanies the text. Library of Congress call numbers are included at the end of the source entry when the source is available in the collections of the Library of Congress.

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SOVIET LITERATURE ON PROTECTIVE STRUCTURES AND COMPONENTS

TOPIC IV. TRANSPORT

B1 Road-- Construction, Bridges

Bridges span rivers. Sovetskaya Rossiya, 19 Feb 1963, 4.

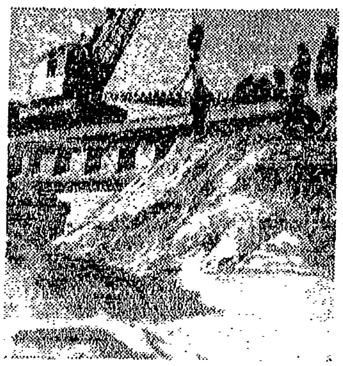
Among the sectional armed, prestressed-concrete bridges built recently, those over the following rivers are mentioned and referred to as the "pride of the builders": the Moskva near the Likhachev Automobile Plant, the Dnepr at Smolensk, the Irkut at Irkutsk, the Yenisey at Krasnoyarsk, the Vyatka at Kirov, and the Ural at Orsk. Regarding the numerous bridges under construction, special mention is made of an automobile bridge almost 3 km long over the Volga at Saratov; a large two-span bridge, with each span 120 m long, over the Volga at Rybinsk; and a "unique" steel bridge over the Severnaya [North] Dvina at Arkhangel'sk, with 176-m spans.

A bridge will span the sea. National Zeitung, 8 Jan 1963, 6.

Consideration is being given to the construction of a bridge over the Caspian Sea, connecting the Apsheron Peninsula with Turkmenia, a distance of 340 km. It would be supported by pontoons made of foamed plastic enclosed in steel shells and anchored to the sea bottom.

C1 Rail-- Construction, Bridges

Komsomol'skaya pravda, 31 Jan 1963, 1.



The photograph shows a small section of a rather heavy railroad bridge and has the following caption: "The builders of the Achinsk-Abalakovo railroad have scored a major victory: the southern and northern crash construction crews met on the bridge across the Belaya River. The traditional silver spike was driven into the last tie. The new road is open to traffic."

E1 Pipelines-- Construction

Pilipenko, G. A. The Igrim-Serov pipeline. Route features and basic project solutions. Stroitel'stvo truboprovodov, no. 12, Dec 1962, 2-4.

Solov'yev, V. P. From the experience gained during the construction of the Ivdel'—Ob' roadbed. Transportnoye stroitel'stvo, no. 1, Jan 1963, 8-11.

The proposed gas pipeline linking Igrim, on the Severnaya Sos'va River, and Serov, with an extension to Nizhniy Tagil, is intended for pumping natural gas from the Berezovo and Igrim deposits to cities and industrial establishments in the Northern Urals. According to Pilipenko, the plan calls for the line to run from the vicinity of Alta-Tump village, located on the right bank of Severnaya Sos'va, due south for about 205 km to the railroad station of Kartop'ya, on the Ivdel'—Ob' railroad now under construction. From Kartop'ya, the pipeline is to follow the railroad for 396 km to Ivdel', and from there for 525 km to Serov. After 1965 the Soviets plan to continue the pipeline from Serov to Nizhniy Tagil in order to link it with the Bukhara-Ural line.

The route from Alta-Tump to Kartop'ya traverses a dense virgin taiga. This sector has about 50 km of swamps, 45 km of sporadic permafrost, and 34 water obstacles. During the spring and summer seasons the area is impassible to standard vehicles; the only means of transport is by waterbuggy. This, according to Pilipenko, calls for a great volume of special construction work. From Kartop'ya to Ivdel' the line will traverse about 57 km of swamps and permafrost islands. From Ivdel' to Serov it will follow the eastern slopes of the Ural Mountains. This sector calls for crossing the Sos'va River, 87 small streams, rivers, ravines, and swamps, and 83 km of rocky terrain. The climatic conditions along the entire route are quite severe. The air temperature ranges from +35°C in summer down to -50°C in winter. The depth of frost penetration ranges from 2.2 to 2.4 m. According to Lengiprotrans data [2], about 80% of the annual precipitation (400-460 mm) takes place during the April-November period. About one-third of the total annual precipitation occurs during July and August.

Bridge over the Amu-Dar'ya River. Sovetskaya Belorussiya, 16 Feb 1963, 1.

A 390-m single-span suspension bridge is being built over the Amu-Dar'ya River at the Dul'Dul' Gorge. The bridge will serve for traffic and will also carry the big gas pipeline leading from Bukhara to the Urals. Construction will be completed by November of this year [1963].

Slonim, E. Ya. Suspension crossing, using lattice-guy-wire girders, on the Bukhara-Ural pipeline. Stroitel'stvo truboprovodov, no. 10, Oct 1962, 5-7.

A new type of guy-wire truss has been developed in the USSR. The construction is reported to be light, highly rigid, stable,

economical, and absolutely safe under aerodynamic loading. The construction is similar to that of a suspension bridge and under certain conditions the pipeline proper may be used as a load-carrying element. The suspension pipeline across the Amu-Dar'ya River (on the Bukhara-Ural gas line) incorporates provisions for a motor vehicle deck. The concept of a suspension bridge using a guy-wire truss was first employed in the USSR during the construction of the Volga Hydroelectric Power Station imeni XXII Congress of the CPSU.

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TOPIC V. LAUNCH SITE

E6 Accessories-- Gantries

Dol'nik, Ye. S., and A. S. Zarkh. ППУ-20 portable lift. Stroitel'nyye i dorozhnyye mashiny, no. 1, 1963, 17-18.

The Moscow Experimental Engineering Plant of the Moscow City Sovnarkhoz has developed and successfully tested the ППУ-20 transportable lift [see illustration]. This hinged, double-lever, collapsible unit is mounted on the 810A trailer manufactured by a plant of the Penza Sovnarkhoz. It consists of the following: basket, upper section (arm), lifting and lowering mechanism for both upper and lower sections, lower section (arm), turntable, turntable drive, stabilizer for the basket, platform, trailer and its prime mover, and the necessary electrical equipment. The specifications for this unit are as follows:

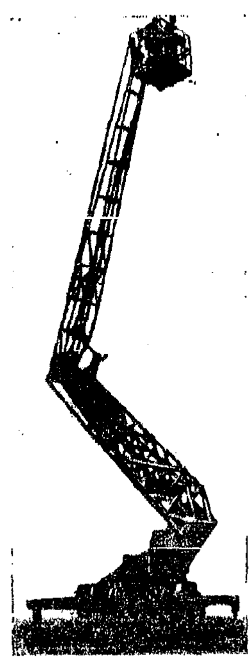

Fig. 1. The ППУ-20 portable lift

Maximum height	20 m
Weight lifting capacity at any height	300 kg
Maximum sweep (radius of operation)	10 m
Speed of movement	16 m/min
Speed of lift	8 m/min
Speed of the turntable	0.2 rpm
Dimensions (in transport)	
length	10 m
width	2.9 m
height	3.6 m
weight of the unit	6.0 tons

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TOPIC VII. NATURAL ENVIRONMENTAL CONDITIONS

General climatic and topographical data

General-- USSR

"Pole of Cold" moves to the European USSR. Moscow TASS in English to Europe, 1311 GMT, 22 Feb 1963 (Radio Broadcast)

The "pole of cold," which has always been in the area of Yakutsk, in northeastern Siberia, this winter shifted to the European part of the Soviet Union. The temperature in Yakutsk, where the January average usually is 40-42°C below zero, was 20-24°C above the average. This trend prevailed throughout Siberia; however, the central and southern districts suffered from heavy frosts. On some days the temperature dropped to -37°C — a 50-year low — in parts of Moldavia and the southern Ukraine. For a large part of January a stable frost of 12-18 degrees was maintained throughout the entire territory from the White Sea to the Black Sea. The Baltic Sea and the Sea of Azov were icebound, and at Odessa the Black Sea froze to a distance of 300 m from shore, requiring the use of icebreakers to keep the port open. The cold periods were protracted and stable. The average January temperature in Moscow was -16°C, compared with the normal -10°C for this month. However, the temperature in Moscow never dropped below 30°C [sic]. The lowest temperature in recent years in Moscow was -42.2°C registered in January 1942. In many parts of the country the frosts were accompanied by abundant snowfall, especially in the south.

Kazakh SSR

Akademiya nauk Kazakhskoy SSR. Sektor geografii. Kazakhskaya SSR; ekonomiko-geograficheskaya kharakteristika (Kazakh SSR; economic and geographic features). Moskva, Geografgiz, 1957, 220-221, 585-587.

Azizyan, A. K., V. F. Reut, and V. V. Smirnov, comps. 25 chasov v kosmicheskom polete; materialy opublikovannyye v "Pravde" (The 25-hour space flight; materials published in "Pravda"). Moscow, Izd-vo "Pravda," 1961, 136.

Baudina, S. B., Ed. Atlas skhem zheleznykh dorog SSSR (Atlas of USSR railroads). Moskva, Glavnoye upravleniye geodezii i kartografii MVD SSSR, 1960, 19.

Blinov, L. K. Gidrokhimiya Aral'skogo morya (Hydrochemistry of the Aral Sea). Leningrad, Gidrometeoizdat, 1956, 11-32.

Lakubov, T. F. The sands of the Urda region, Western Kazakhstan. IN: Akademiya nauk SSSR. Pochvennyy institut imeni V. V. Dokuchayeva. Raboty pustynnoy sektsii Pochvennogo instituta (Works of the Desert Section of the Soil Institute). Moskva, 1935, 227-319. (ITS: Trudy, v. 11, 1935)

Lymarev, V. I. Aral'skoye more (The Aral Sea). Moskva, Geografgiz, 1959, 21-23.

Naumov, S. P., and Ye. P. Spangenberg. Results of a commercial-biological study of the ground squirrel in northern Kyzyl-Kum and the Aral Kara-Kum. IN: Obshchestva izucheniya Kazakstana. Otdel yestestvosnaniya i geografii, Alma-Ata, 1929, 103-141. (ITS: Trudy, v. 10, 1929)

Nikitin, S. A., and V. F. Poyarkov. The meadow regions of the Transuralian desert. IN: Akademiya nauk SSSR. Pochvennyy institut imeni V. V. Dokuchayeva. Raboty pustynnoy sektsii Pochvennogo instituta (Works of the Desert Section of the Soil Institute). Moskva, 1935, 1-146. (ITS: Trudy, v. 11, 1935)

Russia (USSR). MVD. Glavnoye upravleniye geodezii i kartografii. Atlas avtomobil'nykh dorog SSSR (Automobile road atlas of the USSR). 7th ed. Moskva, GUGK MGiON, 1961, 114-115.

Spravochnik passazhira (Passengers' Handbook). Moskva, Transzheldorizdat, 1961, 230-231.

Suslov, S. P. Fizicheskaya geografiya SSSR; Zapadnaya Sibir', Vostochnaya Sibir', Dal'niy Vostok, Srednyaya Aziya (Physical geography of the USSR; Western Siberia, Eastern Siberia, the [Soviet] Far East, Middle Asia). Leningrad, Uchpedgiz, 1947, 445.

Tum, P. P. Aral'skoye more; navigatsionno-geograficheskiy i gidrometeorologicheskiy ocherki (The Aral Sea; navigational, geophysical, and hydrometeorological notes). Moskva, Izd-vo "Morskoy transport," 1960, 20-27.

It is generally know that the main Soviet satellite and space probe launch complexes are located in the Kazakh SSR. According to some sources the launch site of the manned satellites is located in Baykonur, while others indicate that it is located somewhere in the

vicinity of the Aral Sea, most likely along the lower reaches of Syr-Dar'ya, and that only the telemetering and monitoring point is in Baykonur. Since AID Report 62-198 (Report no. 6 of this series) contains some topographical and climatic data on the latter area, this report includes information on some representative areas extending from Transuralia in the west to the central portions of the Kazakh SSR in the east, with emphasis on areas along the 46th parallel.

Nikitin and Poyarkov [14] investigated the region of the lower courses of the Emba, Uil, Dzhaksy-Bay, and Kaldygayty Rivers, located between 46°40' and 50°00' N and 52°00' and 54°30' E. Geomorphologically the region investigated represents a plain, characterized in its southern part by negative elevations and covered by young salinized deposits of the Caspian transgression. Beyond the 8 to 12-km coastal solonchak belt the landscape of the plain features numerous systems of closed, flat depressions called "shor," entirely covered by saline mud and deposits of self-precipitated salt. Northward, in the region drained by rivers, the number of shors diminishes and the relief becomes more intersected, presenting a succession of gently sloping hillocks and depressions with smooth takyr surfaces and solonchaks.

The Urda region, lying within 47°45' - 49°30' N and 46°45' - 49°00' E, contains sands and sandy steppes [10]. The region is characterized by continental climate and annual precipitation rates of less than 250 mm. Deposits of the Caspian transgression mantle the tertiary deposits of the Pliocene age. The region slopes gently towards the Caspian Sea. There is gradual decline in precipitation from west to east; in general, the climate is becoming more continental in character.

The Aral Sea, the largest water body within the entire complex of Kazakh deserts, has a sharply pronounced continental or arid climate [22, p.20]. The basic features of the climate of the Aral Sea are large annual and daily amplitudes of air temperature, intensive insolation during the warm season of the year, and a minimum of annual precipitation. The continental climate moderates from northeast to southwest (from Bol'shoy Sary-Chebanak Bay to Adzhibay Bay). During the winter the Aral Sea region is invaded by continental arctic air moving in from Siberia. This causes a temperature drop to -25 to -30°C. The number of still days is the smallest in fall and winter, owing to the anticyclonic conditions existing at this time. During the spring and summer the invasion of the continental-tropical air of the South Asiatic low pushes the temperature to 35 to 40°C. This alternate invasion of cold arctic air and summer tropical air intensifies the continentality of the Aral Sea and its shores. The sea proper has a limited, indirect modifying influence on the climate of its southern and western portions and its islands, owing to prevailing northerly and northeasterly winds over the sea (for the position of the Aral Sea

in relation to the area described see the highway map on p. 11). The precipitation over the water is very limited; most of it occurs during fall and spring, averaging 15-20 mm/month, and is greatest over the northern part of the sea. Some thunderstorms occur in summer but there is little precipitation (1-2 mm).

The first half of fall is warm and there is little occlusion; during the second half both occlusion and precipitation increase. The first frost occurs in October. The geographical latitude and the sharp continentality of the climate lead to cold winters, with the sea either partly or fully frozen over, and to hot summers, during which the water heats up in shallow areas. The intensive heating of sand deserts and semideserts influences the direction of winds. In summer the occurrence of onshore winds intensifies.

The temperature differences between the northern and southern parts of the Aral Sea are accentuated during the cold season. The annual temperature average ranges from 7.1°C in northern to 9.7°C in the southern part of the sea. The coldest months are January and February, with an average monthly temperature of -12°C in the northern area; the warmest is July, with an average of 26.2°C. The maximum temperature amplitude in the northern part of the sea is 77.5°C. The average annual relative humidity ranges from 62 to 72%. The largest values, 80 to 85%, are observed over the open sea during spring; the humidity along the shore is 20 to 26% lower.

During winter, the prevailing winds are from the north, northeast, and east, with a total occurrence of 46 to 52% and an average velocity of 5.0 m/sec. The incidence of calms is variable and ranges from 5.0 to 11.1% for various areas. During spring the prevailing winds are from the northeast, with an occurrence of west winds of 32 to 46%; in summer the occurrence of westerly winds increases. This increase is explained by the strongly developed low to the south of the Aral Sea. The occurrence of west winds decreases during the fall.

There is very little occlusion over the Aral Sea; the absence of clouds from April to October causes intensified solar radiation during this period.

Table 1. Precipitation (in mm) along the coast of the Aral Sea [22, p. 26]

Locality	Annual	January	April	July	October
Aral'sk	113	9	15	5	13
*GMS Uzyn-Kair	96	4	9	4	18
Uyaly	100	4	8	2	20
Muynak	89	4	14	3	15
Tigrovyy khvost	80	3	13	6	17
*GMS Ak-Tumsuk	124	3	14	2	9
Vozrozhdeniya	96	5	14	4	16

* State Meteorological Station

Table 2. Average precipitation (in mm) over the water of the Aral Sea [5, p.21]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Observations of V. D. Zaykov and V. S. Samoylenko	6 4	8 6	9 10	12 9	9 6	6 3	6 3	7 5	6 8	10 15	8 10	8 6	95 85

The thickness of ice in the Aral Sea ranges from 76 cm in its northern portion (Bol'shoy Sary-Chebanak Bay) to 40-45 cm in Adzhibay Bay. The sea is frozen over for 140 to 150 days in its northern portions and 110 to 120 days in the south. Generally, it freezes over by December and remains covered with ice till the middle of April. The following table gives the data on the navigation seasons from 1935 through 1959:

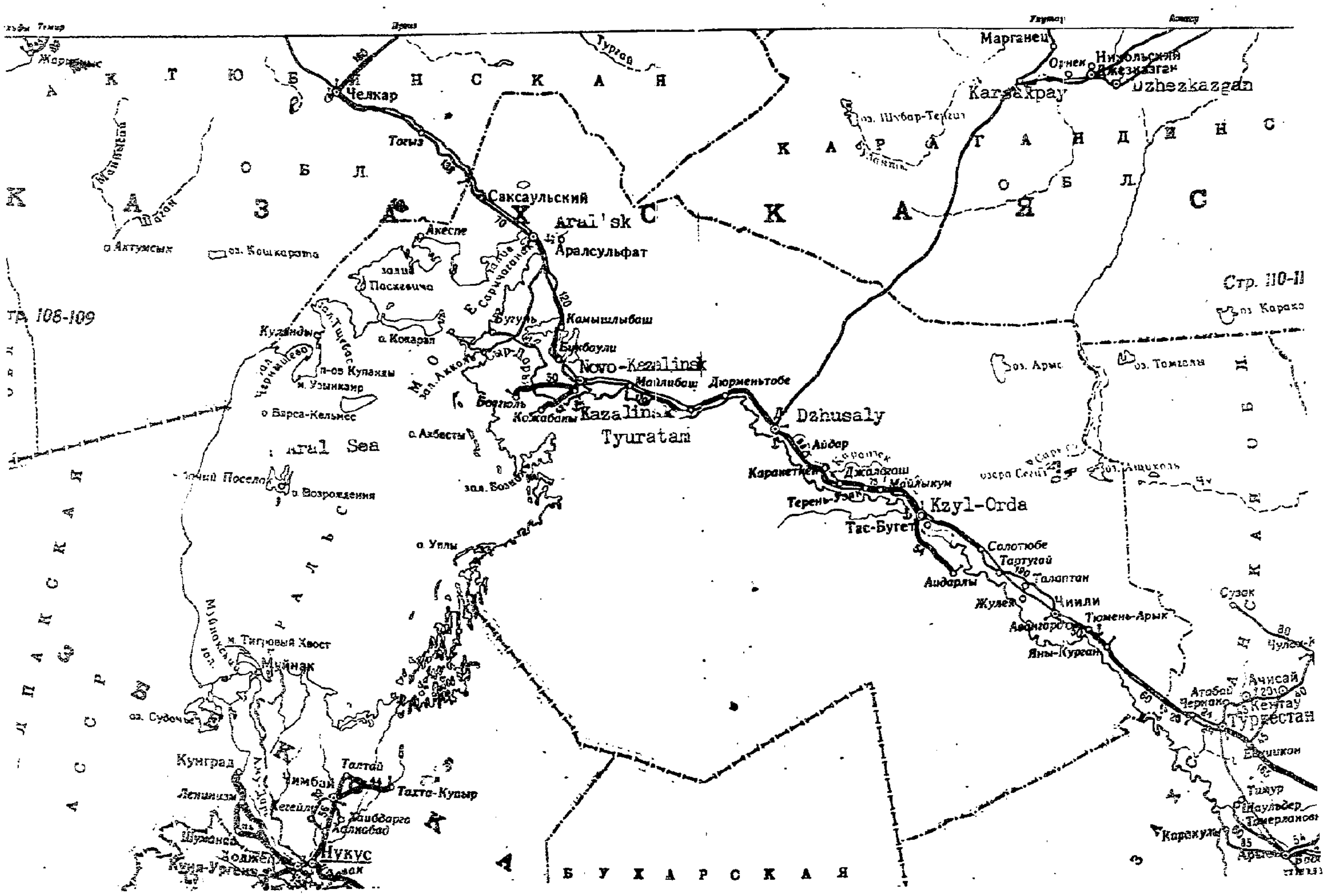
Table 3. Duration of the navigation season in the Aral Sea [22, p.39]

Year	Date of opening of navigation	Date of closing of navigation	Length of navigation seas (in days)
1935	22 April	23 November	216
1936	26 "	6 December	225
1937	18 "	25 November	222
1938	16 "	22 "	221
1939	17 "	26 "	224
1940	14 "	25 "	226
1941	8 "	24 "	231
1942	28 "	14 December	231
1943	27 "	27 November	215
1944	28 March	27 "	245
1945	30 April	25 "	210
1946	10 "	25 "	230
1947	15 "	7 December	237
1948	19 "	3 "	229
1949	28 "	18 "	235
1950	28 "	25 November	212
1951	19 "	10 December	236
1952	19 "	12 "	238
1953	18 "	3 "	230
1954	28 "	29 November	216
1955	9 "	18 December	254
1956	23 "	18 "	254
1957	20 "	21 "	240
1958	24 March	11 "	246
1959	16 April	-	-

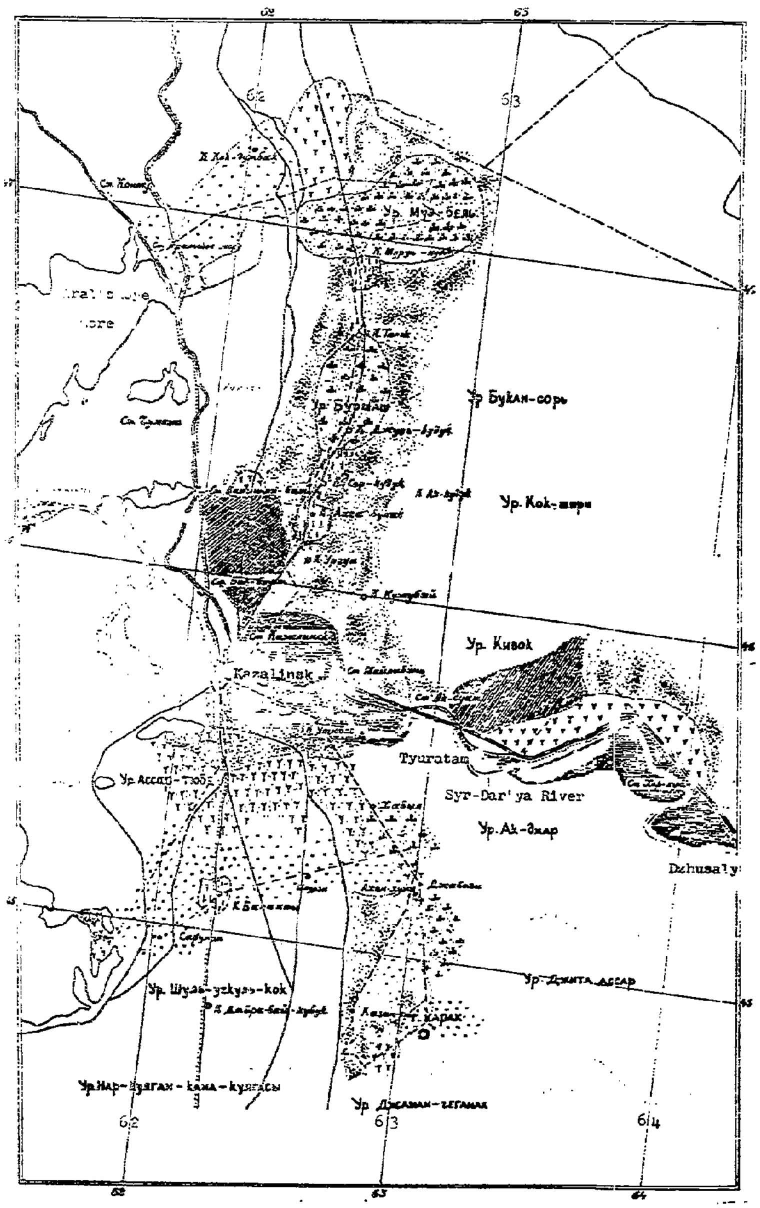
The largest river in the area covered by this report is the Syr-Dar'ya [20, p. 445]. Above Kzyl-Orda an old river bed, the Yany-Dar'ya, branches off the Syr-Dar'ya and proceeds almost due west across the Kyzyl-Kum Peski [sands] in the direction of the Aral Sea. During the dry season the Yany-Dar'ya is completely dry; during the wet season it contains water for about 300 km from the Syr-Dar'ya, till it disappears in the sands. Approaching the Aral Sea, the Syr-Dar'ya splits into numerous sleeves and forms its current "classical" delta. Throughout its lower reaches it flows through an elevated trough. During even small rises in the water level, the water flows across the walls of the trough, flooding large areas along the river. The maximum flow at the mouth of the river (in June) reaches 1262 m^3/sec; the minimum (in January) is only 336 m^3/sec. The river freezes over during early December and remains ice-covered until the beginning of April. From Dzhusaly to Kazalinsk the river traverses an area described by Naumov and Spangenberg [13], who also compiled the following map.

The area covered by this map extends south from the 47th parallel to the Kurandar'ya river bed (approximately 45°N) and from the Aral Sea in the west to 63°30' E. The entire area is divided into two approximately equal parts by the Syr-Dar'ya. The northern part is occupied by the Kara-Kum Peski [sands] and the southern by the northwestern sector of the Kyzyl-Kum Peski [sands]. The entire region is covered by wormwood-clayey or solonetz and takyr deserts and a variety of sands. A remarkable uniformity of the landscape, weakly developed verticality of relief, almost complete absence of fresh water bodies, and sparsely developed vegetation and animal life are the main features of this area. The only exception is the southeastern part of the Syr-Dar'ya valley, which is covered with a green belt of bulrushes. A pebbly desert is located to the north of the railroad linking Kamyshly-Bash and Tyuratam. This particular area has a rolling character and is covered with gravel and poorly rounded pebbles. The vegetation cover consists basically of saltwart and an insignificant admixture of wormwood. A belt up to 10 km wide of wormwood-grass desert extends along the railroad from Tyuratam almost to Dzhusaly.

Other populated centers in the area extending from Aralsk to Kzyl-Orda are Novo-Kazalinsk, Kazalinsk, and Dzhusaly [4, pp. 585-587]. The largest of them all is Kzyl-Orda (44°48' N, 65°28' E), the administrative center of the Kzyl-Ordinskaya oblast'; its population is 50,000. Kzyl-Orda is located on the railroad, near the Syr-Dar'ya River, and has a hotel, a movie house, a teachers' institute, a railroad station, and agricultural and technical schools. There is a bus connection between the center of Kzyl-Orda, the railroad station, and a new workers' settlement-Tas-Buget. There are parks around the city, and Baynak Lake, where "...the city people spend their holidays..." [13] is about 4 km from the city. It presumably has an airport, which was reported in 1956 air route schedules. This information does not appear on the currently available Passengers' Handbook. Dzhusaly (45°28'N,



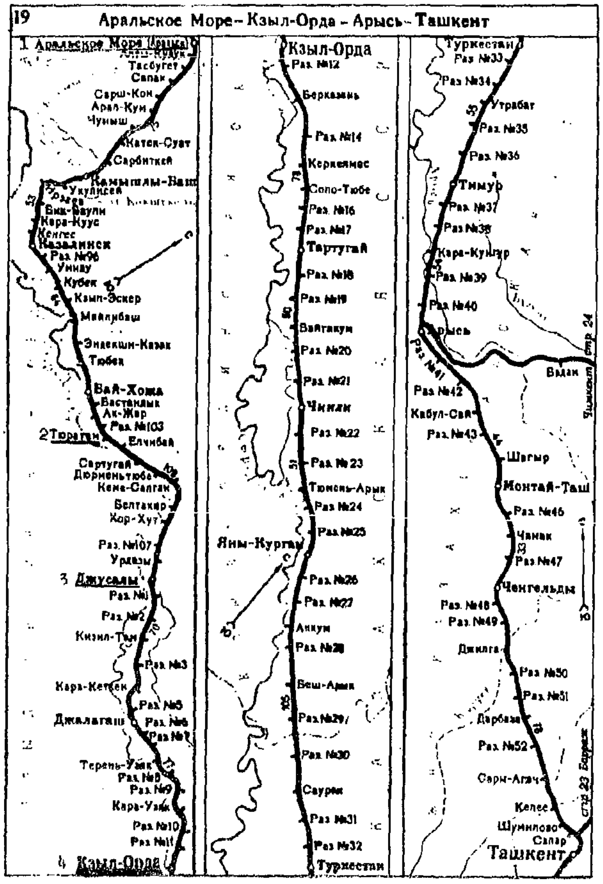
Map 1. Kazakhskaya SSR; Kzyl-Ordinskaya Oblast



Map 2. Lower reaches of the Syr-Dar'ya
Scale 1:1,000,000 [3].

Legend

1. Route of expedition
2. Solonety lowlands
3. Wormwood desert
4. Wormwood-grass desert
5. Wormwood-haloxylon desert
6. Sand-grass desert
7. Sand mounds (hilly)
8. Sand dunes
9. Rocky (gravel)



Map 3. Railroad linking the Aral Sea with Kzyl-Orda [17] (left above)

Legend: 1 - Aral Sea (Aral'sk); 2 - Tyuratam; 3 - Dzhysaly; 4 - Kzyl-Orda.

64°05' E), with a population of about 10,000, is located on the Syr-Dar'ya about 140 km west of Kzyl-Orda. Although less populous than the latter, Dzhusaly has an airport which maintains air connections with Kuybyshev, Leninabad, Dushanbe, Tashkent, Ural'sk, Frunze, Chelyabinsk, Chimkent, Mineral'nyye Vody, Orenburg, Penza, Samarkand, and Sverdlovsk. [19] For the locations of the above points see Map 3 on p. 13.

Both Novo-Kazalinsk and Aral'sk have populations of about 20,000. The former is on the Moscow-Tashkent railroad and also serves as a transhipment point for railroad loads designated for water shipment to points south across the Aral Sea. The same source carries an interesting note which could be used to supplement the information on the Baykonur-Dzhezkazgan area contained in AID Report 62-198, AID Work Assignment No. 13, Report 6. This information is as follows:

> Fifty-seven km to the west of Dzhezkazgan is the settlement Karsakpay - the administrative center of the Dzhezkazgan rayon. Its population is about 10,000. It is located in a valley surrounded by sandstone hills devoid of vegetation. These hills are the source building materials for houses. The settlement was founded in 1911 in connection with the building of a copper smelter.(Footnote - the narrow-gage railroad from Dzhezkazgan through Karsakpay to Baykonur, its equipment, rails, and ties had to be moved on camels from Dzhusaly. It took 3 years to accomplish this task.) ...Baykonur was founded in 1916 at the source of lignites. (Footnote - in connection with the depletion of lignite deposits, the population of Baykonur decreased in recent years. The narrow-gage railroad linking Karsakpay with Baykonur (57 km) has been dismantled...)[2, pp. 220-221]

The assumption that the Vostok II launch site is located somewhere along the Syr-Dar'ya River rather than in the vicinity of Baykonur as claimed by the Soviets [3, insertion following p. 96] is supported by the following account describing the automobile trip to the launch site:

> "...It is hot. Our vehicle is traveling over an asphalt road traversing a limitless plain. Settlements and towns, high-power lines are flashing by. Suddenly, around the curve we begin to distinguish in the distance a framework structure. We draw nearer. Through a dense network of metal girders shines the cigar-shaped body of a multistage rocket. Gigantic girders carefully though firmly support the rocket, which appears ready to take off without the permission of its builders..." [3, p. 136]

TOPIC X. PACKAGING, PRESERVATION, AND STORAGE

A2 Containers

Packing electronic equipment for export. Referativnyy zhurnal: 31. Vzaimodeystviye raznykh vidov transporta i konteynernyye perevozki, no. 1, Jan 1963, 1-31-98. [FROM: Opakowanie, 8, no. 2, 1962, 16-18]

The existence of relatively heavy parts mounted on a relatively weak frame, sensitivity to mechanical actions (vibrations), and atmospheric changes are the basic difficulties encountered in transporting electrical equipment. The design of packing materials should take into account their possible use on air or sea transportation. Packing materials used in Poland belong to the following categories: a) wooden cases (crates), b) cases made of hardboard, and c) cardboard boxes. Containers made of hardboard are preferred. In transporting radioelectronic equipment, special attention should be paid to shock-absorbing fixtures, which are most effective in protecting the contents from damage. The production of Pakafram containers for transport in corrugated boxes is being planned. Experience amassed by East Germans shows that air transport of radio receivers although expensive, is the most reliable mode in terms of damage prevention.

Grinevich, G. P. Mekhanizatsiya i avtomatizatsiya pogruzochno-razgruzochnykh rabot i sklady na zheleznodorozhnom transporte (Mechanization and automation of loading and unloading operations and storage in railroad transport). Moskva, Transzheldorizdat, 1962. 238-239.

The standard ГОСТ 9106-59, effective 1 January 1960, specifies that the gross weight of small containers will be 1.25 tons, of medium-size containers—2.5 tons, and of large containers—5 tons. The external dimensions are as follows:

Gross weight of container, tons	Dimensions in mm		
	Length	Width	Height
1.25	1300	1050	2000
2.50	2100	1300	2500
5.00	2600	2100	2500

The height of containers designated for transport in closed railroad cars has been also adopted for packages. The height of containers for transport by truck may go as high as 2000 mm. The required clearance between containers loaded on cars is up to 2 cm. Specifications of universal containers currently used in the USSR are given in the following table.

Specifications of universal containers currently used in the USSR

Types of containers	Load carrying capacity, kg		Wt. of packing, kg	Linear (outside) dimensions, mm			Floor area, m^2	Volume, m^3	Dimensions of doors, mm
	net	gross		length	width	height			
Wooden УД 2.5-ton with horizontal lid	1900	2500	600	2120	1325	2330	2.21	5.0	980 x 2100
Metallic, 2.5-ton, type ЛИИЖТ 1948, with inclined lid	1920	2500	580	2120	1310	2300	2.18	4.86	990 x 2110
Metallic УМ 2.5-ton with horizontal lid	1920	2500	580	2120	1310	2300	2.18	5.0	990 x 2050
Metallic, frameless, with horizontal lid	1850	2500	650	2112	1317	2328	2.26	5.2	990 x 2110
Metallic, 5 tons, with horizontal lid	4000	5000	1000	2610	2080	2245	5.42	10.3	1300 x 2145

Containers used in international transit have load-carrying capacities of 2.5 and 5 tons and the following dimensions: Length, 1.05, 1.5, 2.15, and 3.25 m; width, 2.15 m; and maximum height, 2.55 m. In the future the Soviet Union contemplates the introduction of containers with load-carrying capacities of 10 or 20 tons and more.

Murin, Josef. Containers in Soviet railroad transport. Železniční doprava a technika, no. 1, 1963, inside cover.

Soviet rail transport employs two types of containers with the following dimensions:

	Type I	Type II
Gross weight	2500 kg	1250 kg
Weight of container	580 kg	250 kg
Load-carrying capacity	1920 kg	1000 kg
Volume	5.1 m^3	2.4 m^3

Carcasses of these containers are made either of wood or metal. Figure 2 shows the double doors for loading purposes and Fig. 3 shows the transportation of these containers on trucks and trailers.

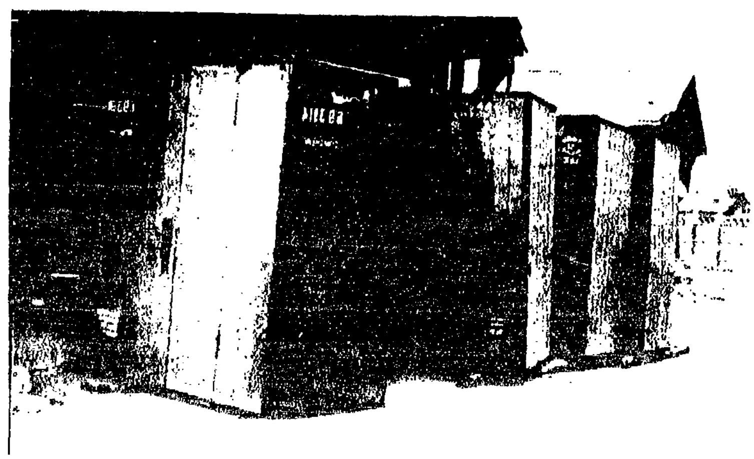


Fig. 2.

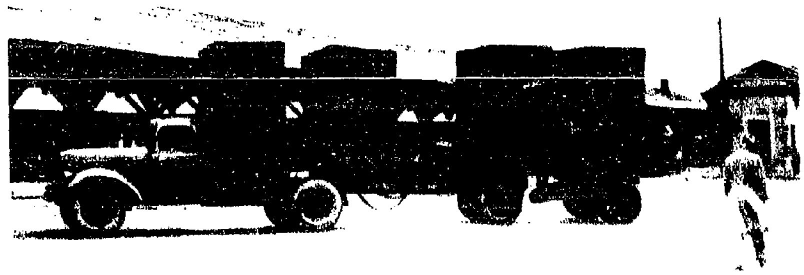


Fig. 3

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